

CLAIMS

What is claimed is:

1. An extrusion die comprising:
 - an inner die portion having a male form, the male form having a male
5 complex shape with peaks and a valley;
an outer die portion having a female form, the female form having a
female complex shape with peaks and a valley which corresponds to the male
complex shape of the male form, the female complex shape surrounding and
being separated from the male complex shape by a gap, flowable material
10 capable of being extruded through the gap between the male and female
complex shapes to form a hollow profile; and
an adjustment mechanism comprising an outer member surrounding the
outer die portion, and at least eight adjustment screws threaded through the outer
member and engaging the outer die portion at equidistant angular locations to
15 enable controlled adjustment of the female complex shape relative to the male
complex shape for adjusting the gap and for adjusting the position and
orientation of the corresponding peaks and valleys of the male and female
complex shapes relative to each other.
2. The die of Claim 1 in which the male complex shape of the inner die portion is
20 surrounded by the female complex shape of the outer die portion on all sides.
3. The die of Claim 1 in which the male and female complex shapes have multiple
valleys.
4. The die of Claim 3 in which the male complex shape has at least four peaks and
two valleys.

5. The die of Claim 4 in which the peaks and valleys are symmetrically divided on opposite sides of a central axis.
6. The die of Claim 1 in which the inner die portion is fixed within a spider pipe.
7. The die of Claim 6 in which the outer member of the adjustment mechanism is a
5 retaining ring which secures the outer die portion to the spider pipe, the adjustment screws being threaded radially inwardly through the retaining ring to engage the outer die portion.
8. An extrusion die comprising:
an inner die portion having a male form, the male form having a male
10 complex shape with multiple peaks and valleys;
an outer die portion having a female form, the female form having a female complex shape with multiple peaks and valleys which corresponds to the male complex shape of the male form, the female complex shape surrounding the male complex shape on all sides and being separated from the male complex
15 shape by a gap, flowable material capable of being extruded through the gap between the male and female complex shapes to form a hollow profile; and
an adjustment mechanism comprising a retaining ring surrounding the outer die portion, and at least eight adjustment screws threaded through the retaining ring and engaging the outer die portion at equidistant angular locations
20 to enable controlled adjustment of the female complex shape relative to the male complex shape for adjusting the gap and for adjusting the position and orientation of the corresponding peaks and valleys of the male and female complex shapes relative to each other.
9. The die of Claim 8 in which the male complex shape has at least four peaks and
25 two valleys.

10. The die of Claim 9 in which the peaks and valleys are symmetrically divided on opposite sides of a central axis.
11. The die of Claim 8 in which the inner die portion is fixed within a spider pipe.
12. The die of Claim 11 in which the retaining ring secures the outer die portion to the spider pipe, the adjustment screws being threaded radially inwardly through the retaining ring to engage the outer die portion.
13. A method of adjusting an extrusion die, the extrusion die comprising an inner die portion having a male form, the male form having a male complex shape with peaks and a valley, and an outer die portion having a female form, the female form having a female complex shape which with peaks and a valley which corresponds to the male complex shape of the male form, the female complex shape surrounding and being separated from the male complex shape by a gap, flowable material capable of being extruded through the gap between the male and female complex shapes to form a hollow profile, and an adjustment mechanism comprising an outer member surrounding the outer die portion, at least eight adjustment screws being threaded through the outer member and engaging the outer die portion at equidistant angular locations in opposed pairs, the method comprising:
 - in selected opposed pairs of adjustment screws, each having a first and second adjustment screw, sequentially and repeatedly loosening the first adjustment screw and tightening the second adjustment screw of a pair to obtain incremental lateral movement of the outer die portion relative to the inner die portion and subsequently adjusting the remaining adjustment screws to relieve compression or remove slack caused by the lateral movement, the incremental movement enabling controlled adjustment of the female complex shape relative to the male complex shape for adjusting the gap, and for adjusting the position

and orientation of the corresponding peaks and valleys of the male and female complex shapes relative to each other.